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PATENT & TRADEMARK OFFICE

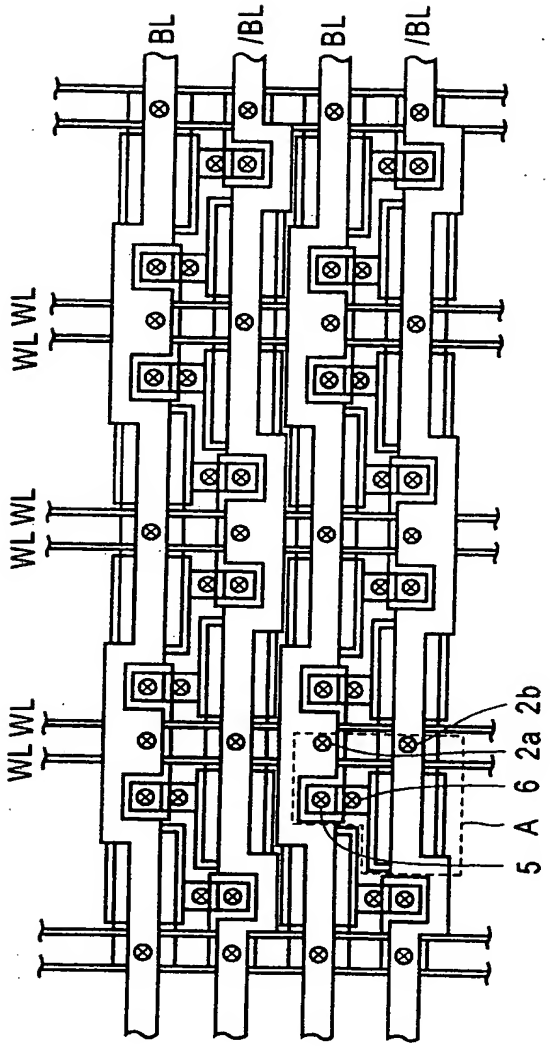


FIG.1

FIG.2

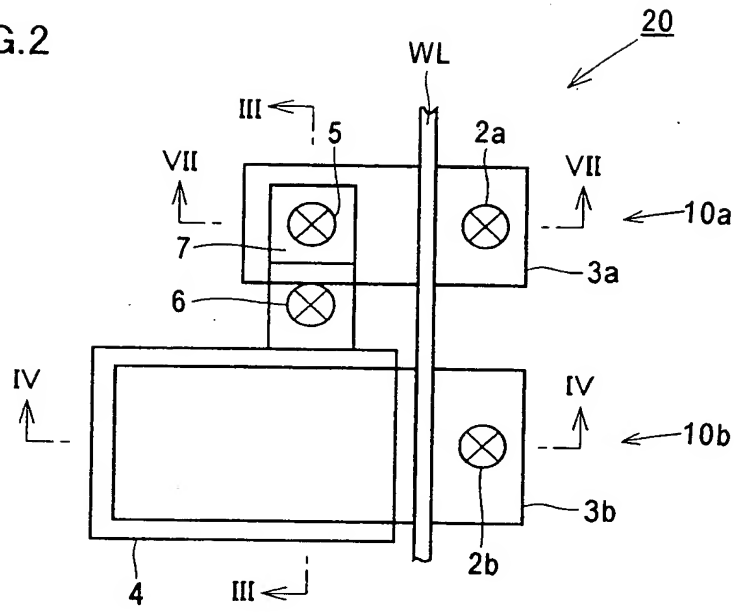


FIG.3

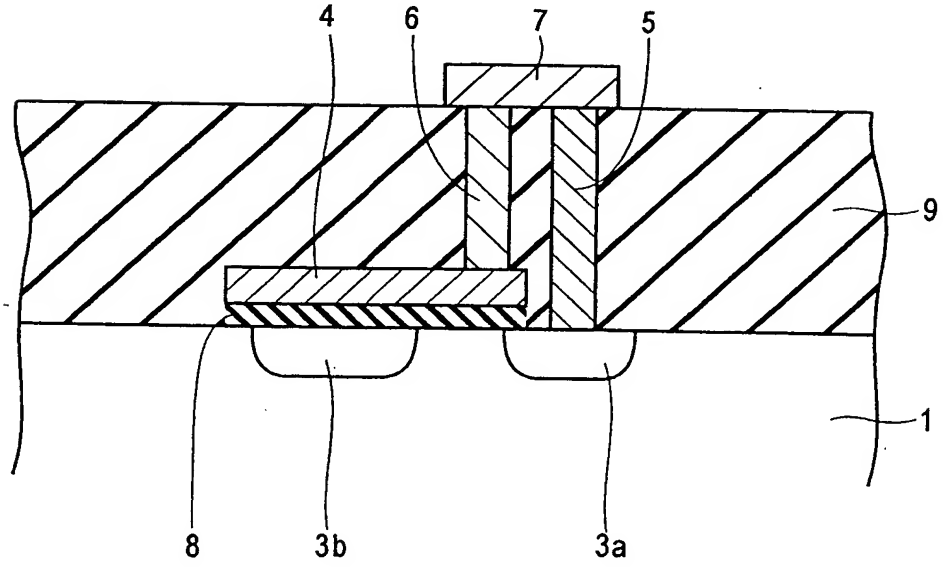


FIG.4

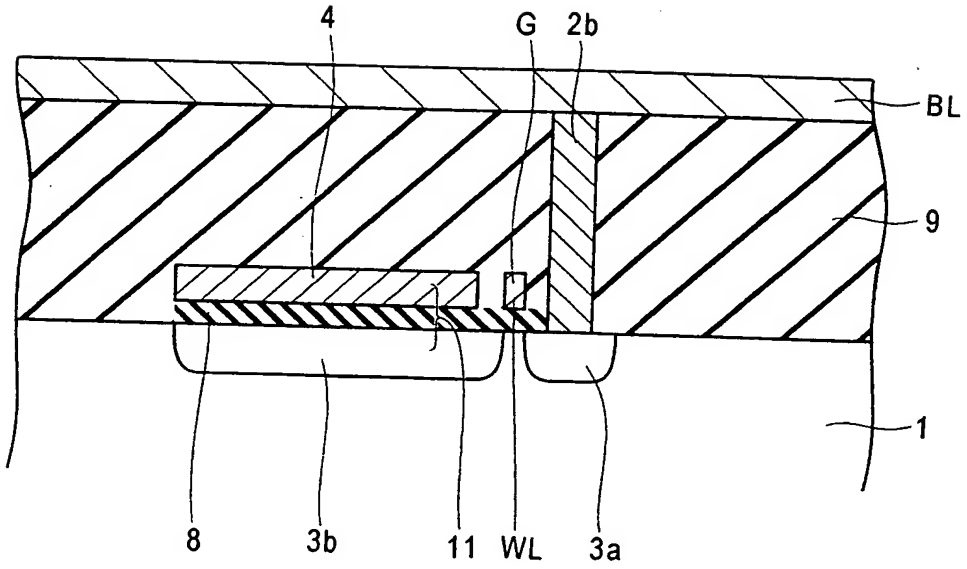


FIG.5

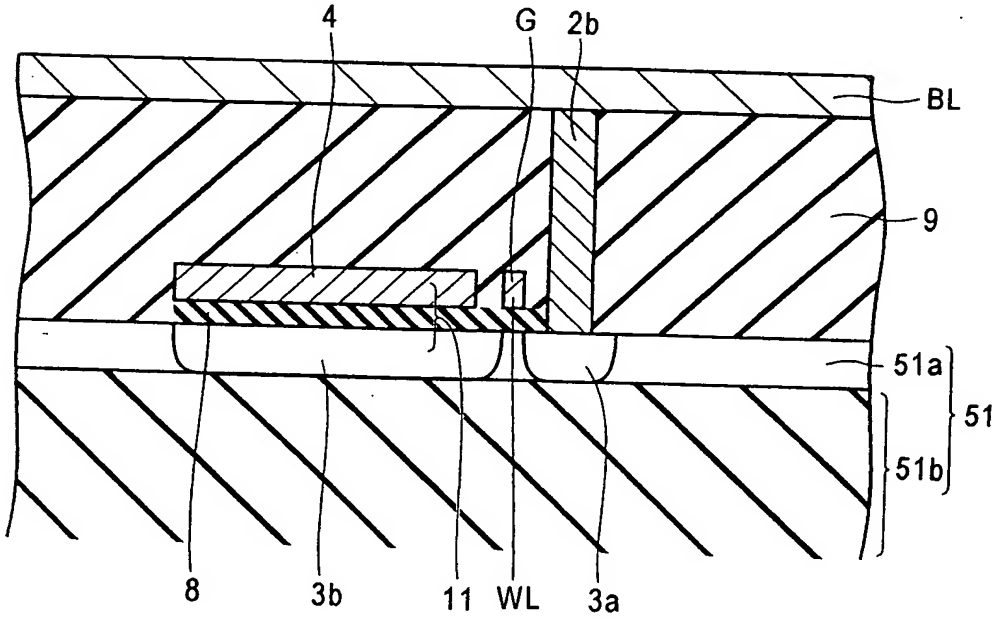


FIG.6

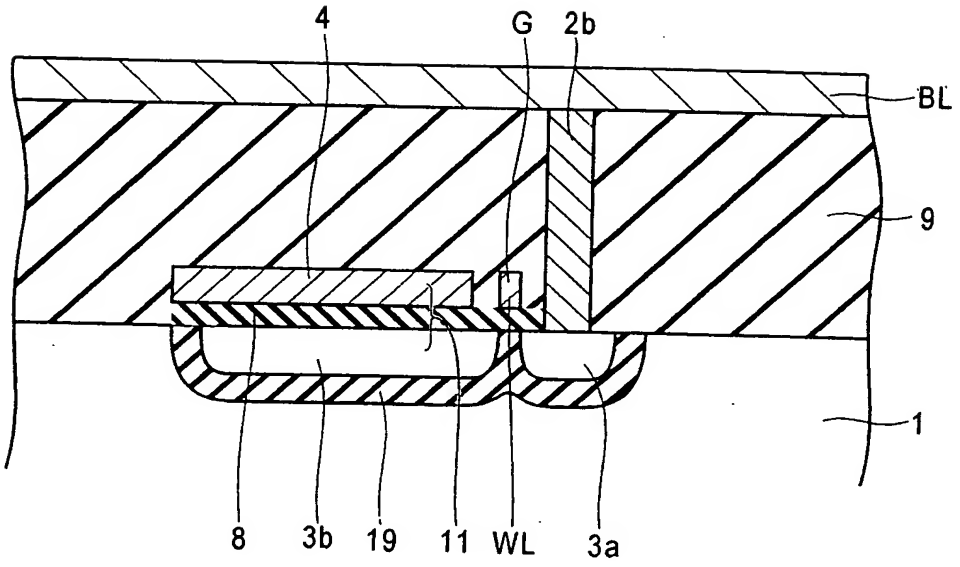


FIG.7

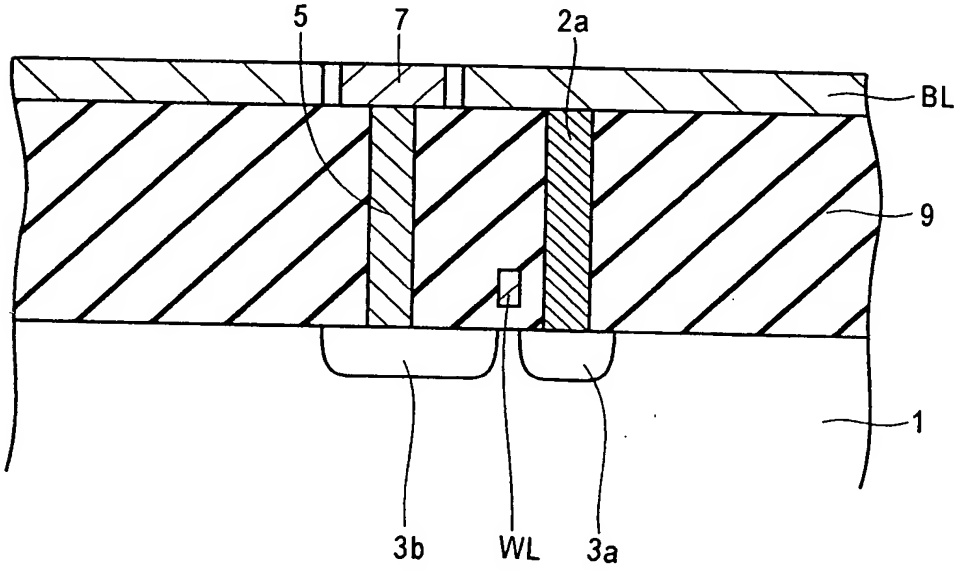


FIG.8

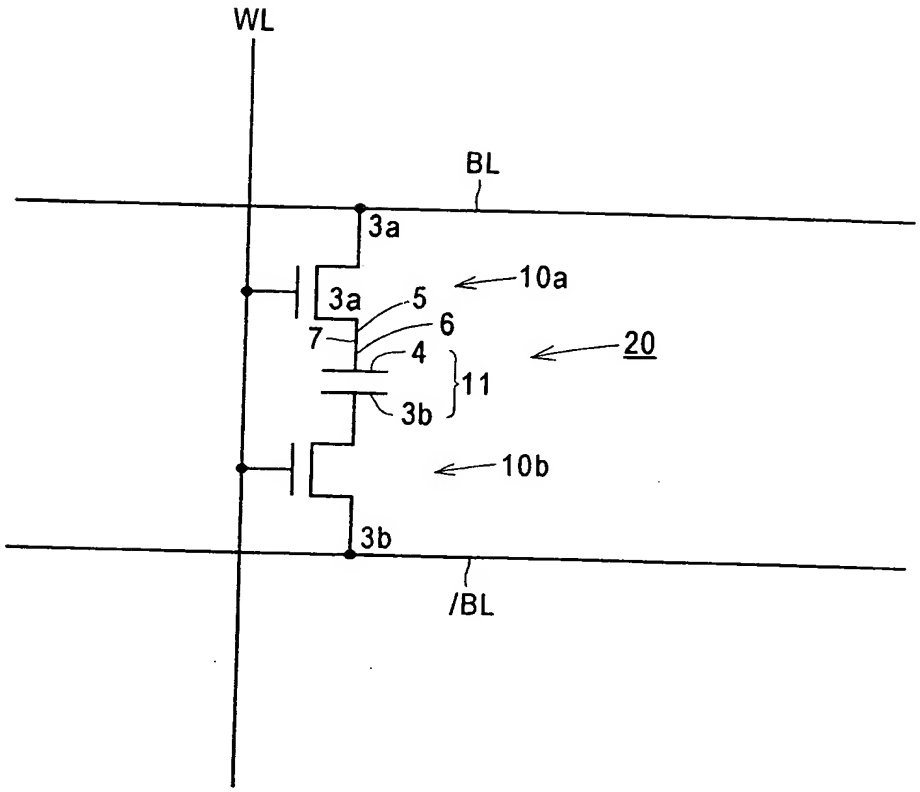


FIG.9

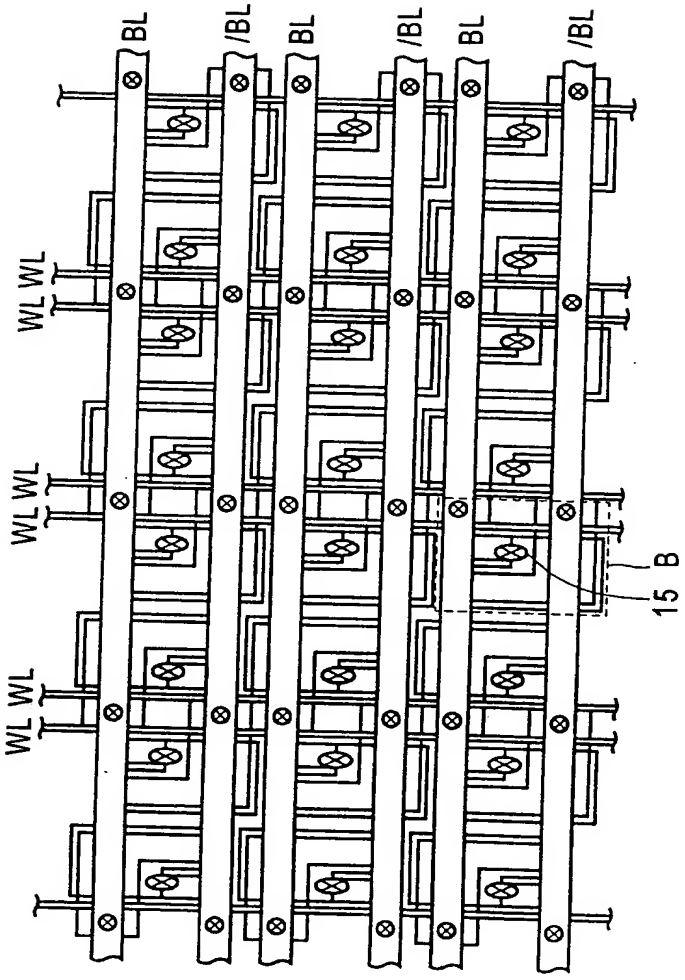


FIG.10

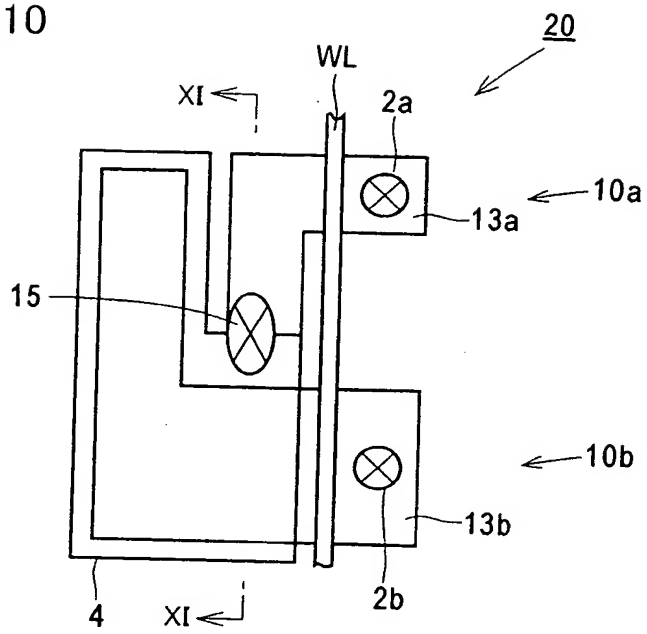


FIG.11

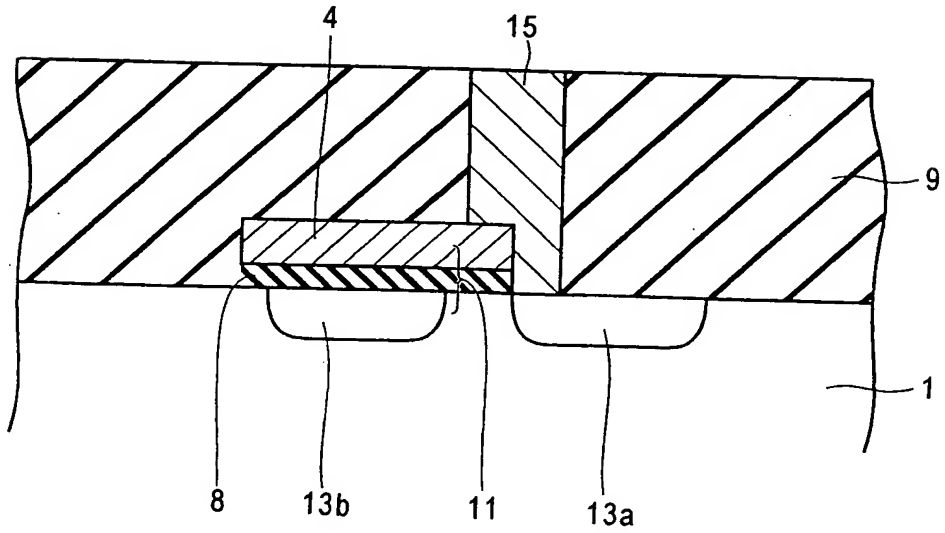


FIG.12

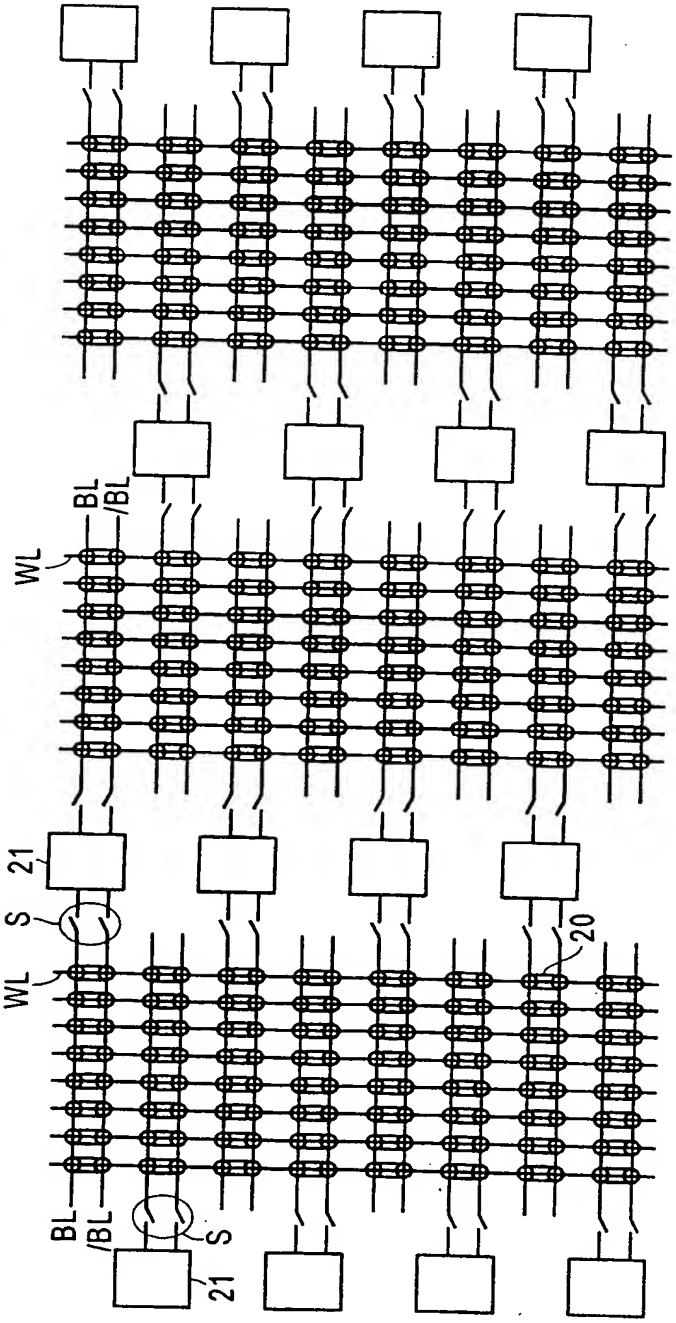
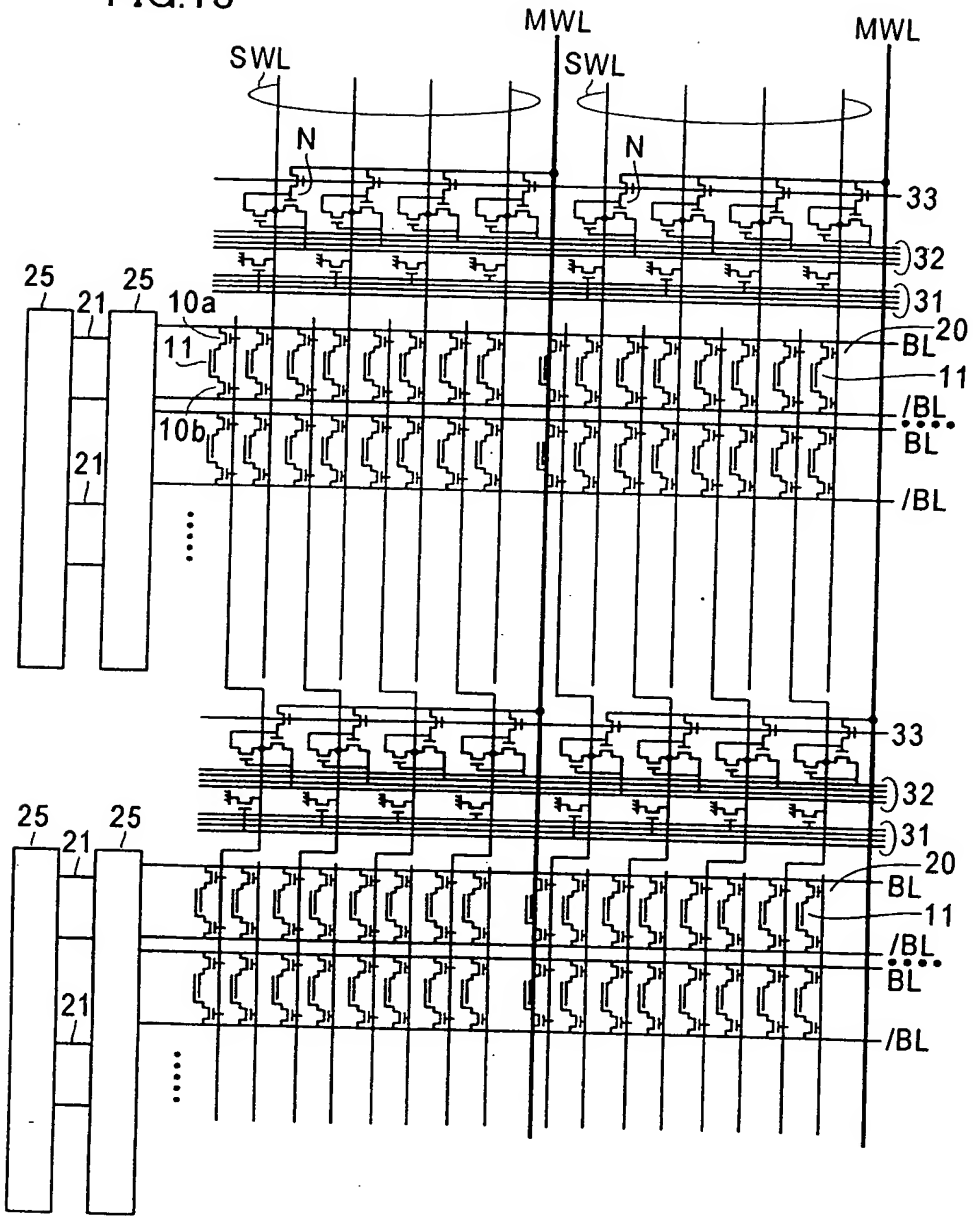


FIG.13


MWL
MWL
SWL
SWL
N
N
33
32
31
20
BL
11
/BL
BL
/BL
25
21
25
10a
11
10b
21
33
32
31
20
BL
11
/BL
BL
/BL
25
21
25
21

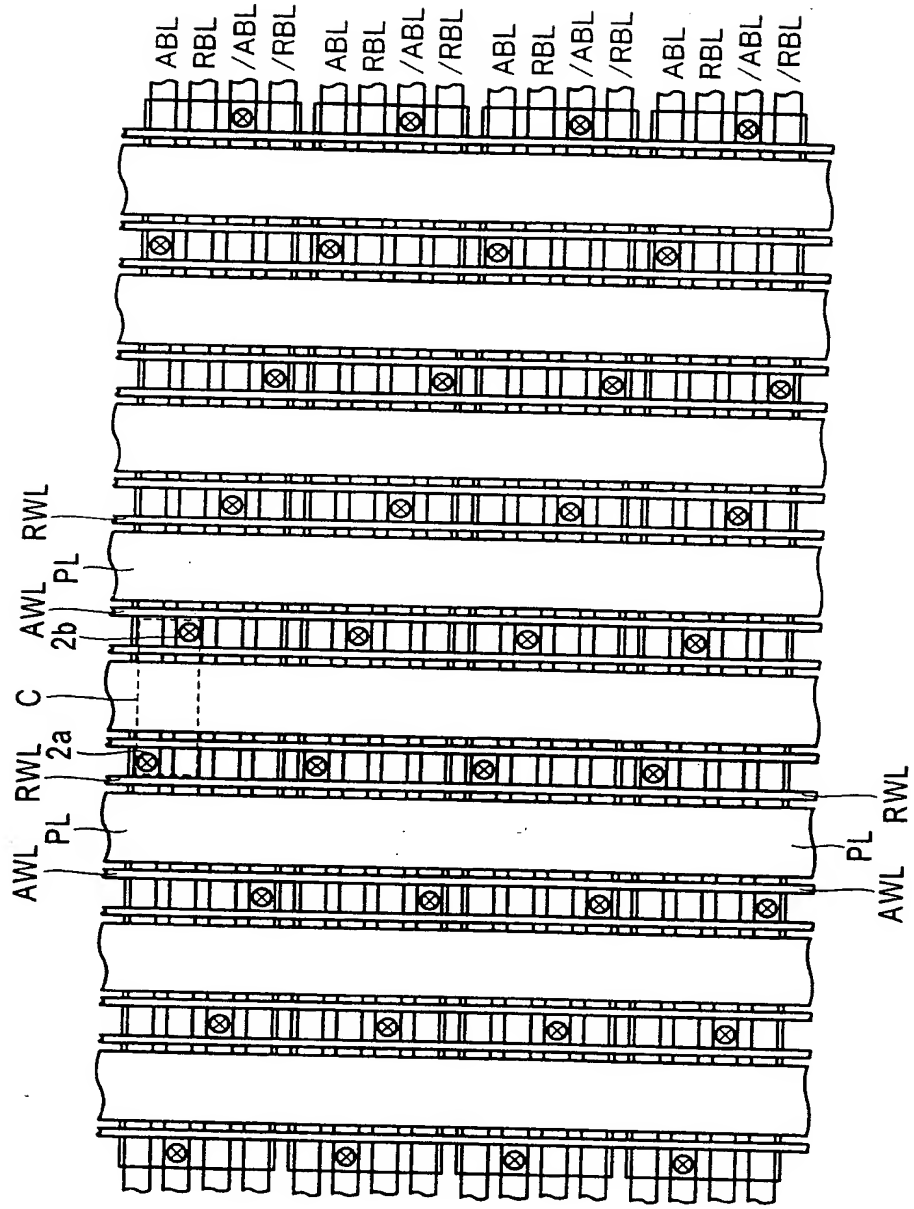


FIG.14

FIG.15

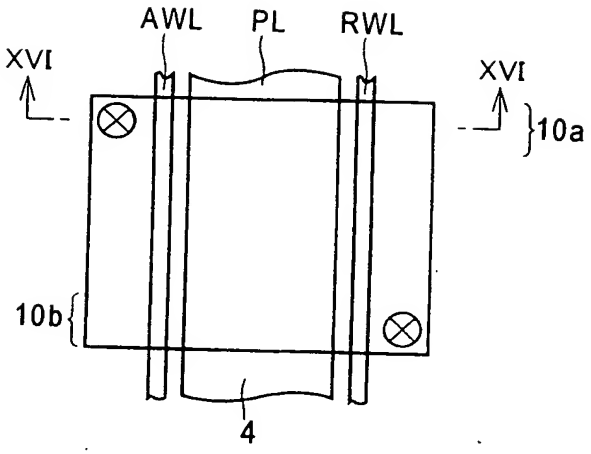


FIG.16

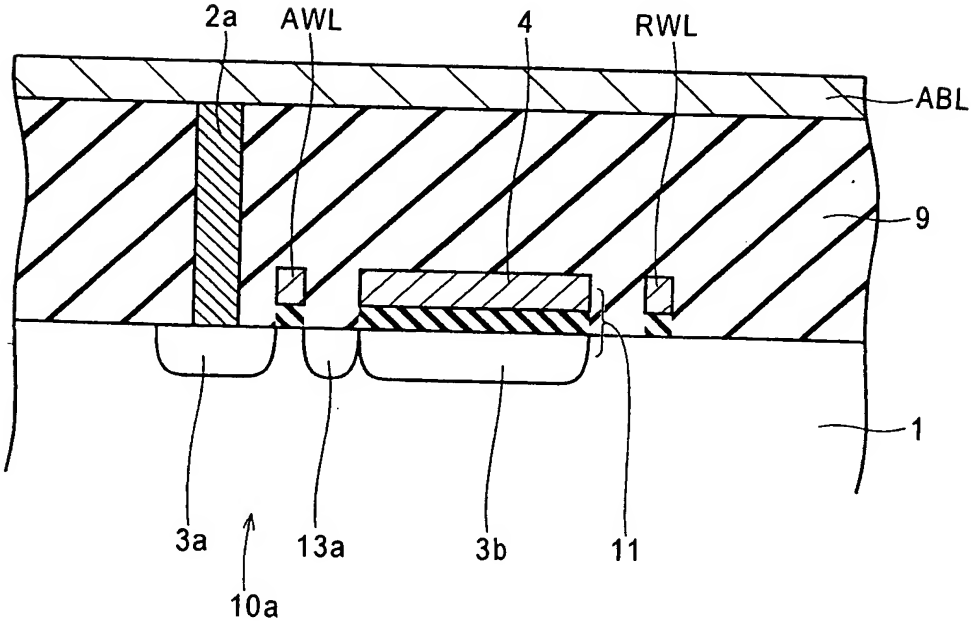


FIG.17

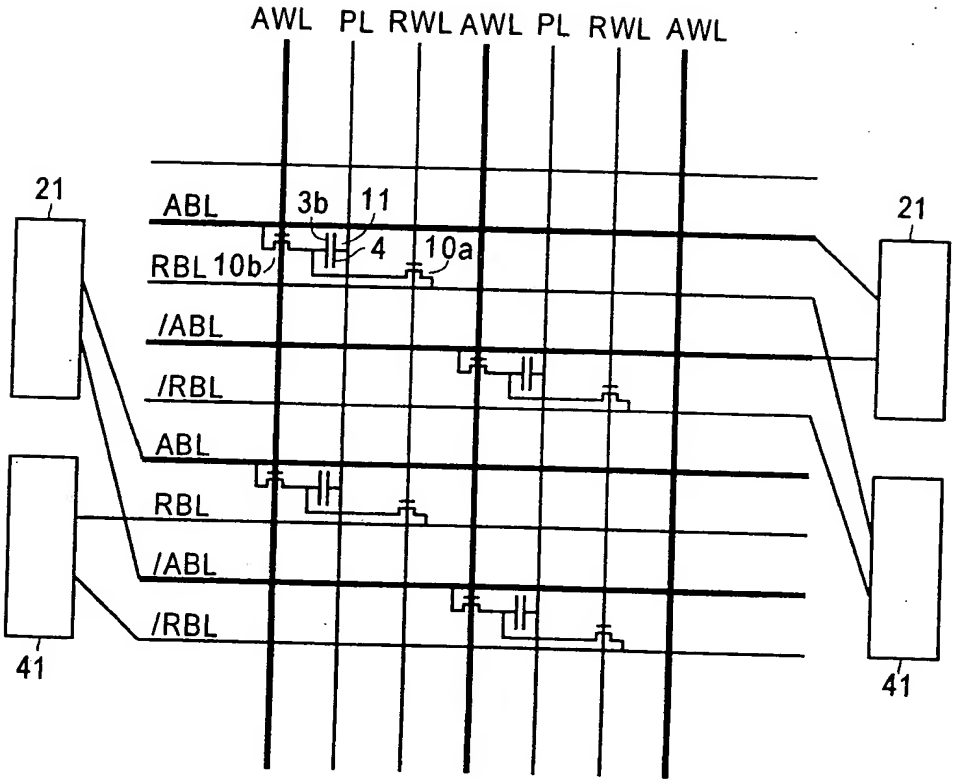

AWL
PL
RWL
AWL
PL
RWL
AWL
21
ABL
3b
11
4
10a
RBL
10b
/ABL
/RBL
ABL
RBL
/ABL
/RBL
21
41
41

FIG.18

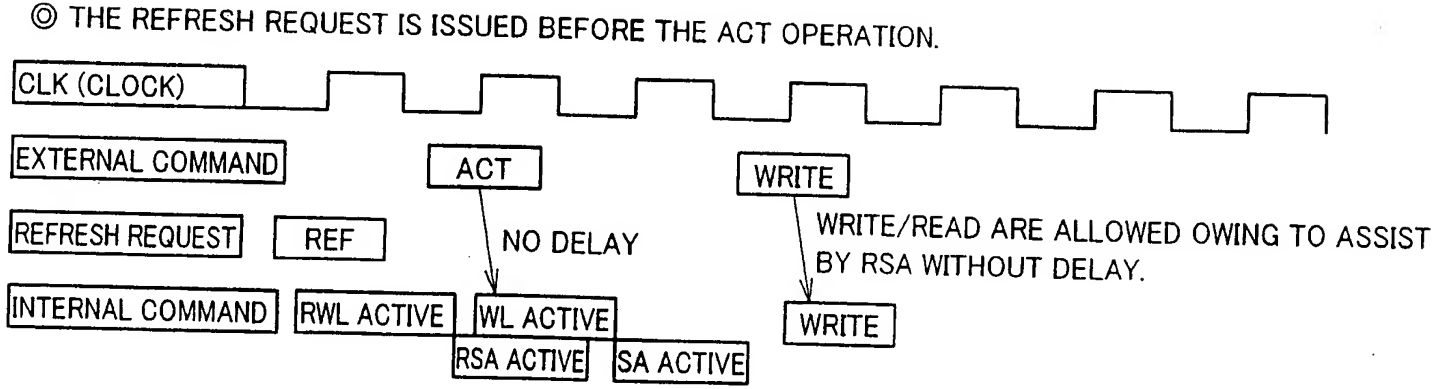

◎ THE REFRESH REQUEST IS ISSUED BEFORE THE ACT OPERATION.
CLK (CLOCK)
EXTERNAL COMMAND
ACT
WRITE
REFRESH REQUEST
REF
NO DELAY
WRITE/READ ARE ALLOWED OWING TO ASSIST BY RSA WITHOUT DELAY.
INTERNAL COMMAND
RWL ACTIVE
WL ACTIVE
WRITE
RSA ACTIVE
SA ACTIVE

FIG.19

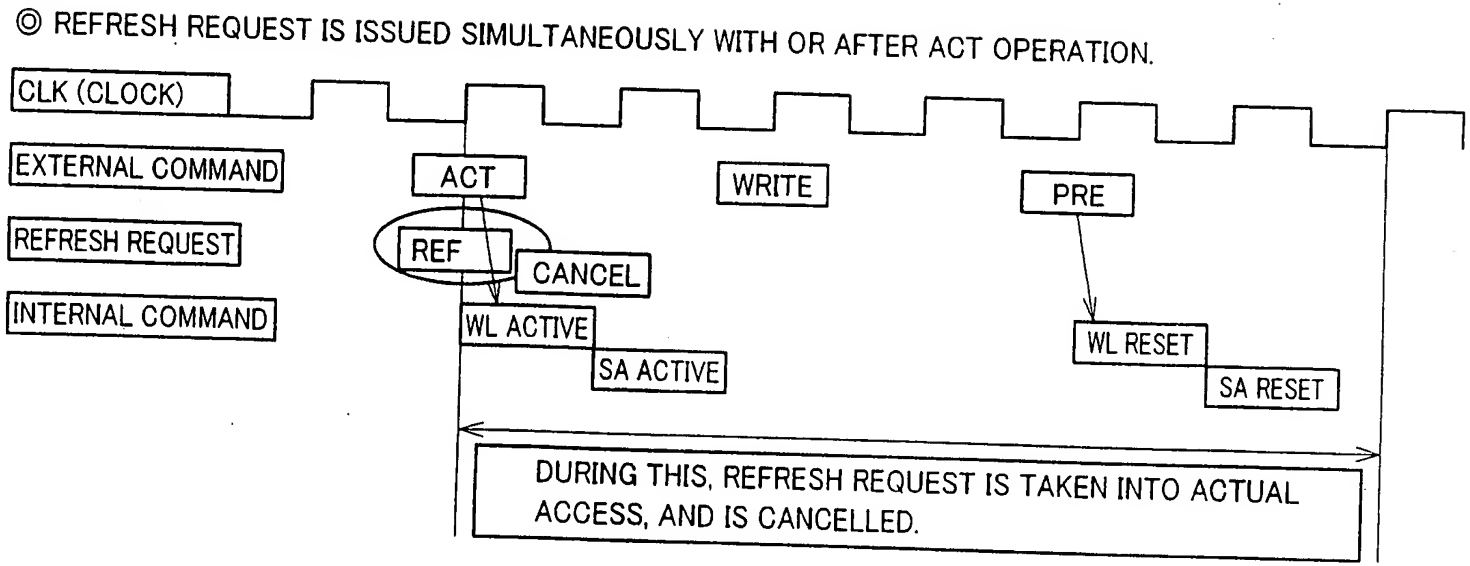

◎ REFRESH REQUEST IS ISSUED SIMULTANEOUSLY WITH OR AFTER ACT OPERATION.
CLK (CLOCK)
EXTERNAL COMMAND
REFRESH REQUEST
INTERNAL COMMAND
ACT
WRITE
PRE
REF
CANCEL
WL ACTIVE
SA ACTIVE
WL RESET
SA RESET
DURING THIS, REFRESH REQUEST IS TAKEN INTO ACTUAL ACCESS, AND IS CANCELLED.

FIG.20

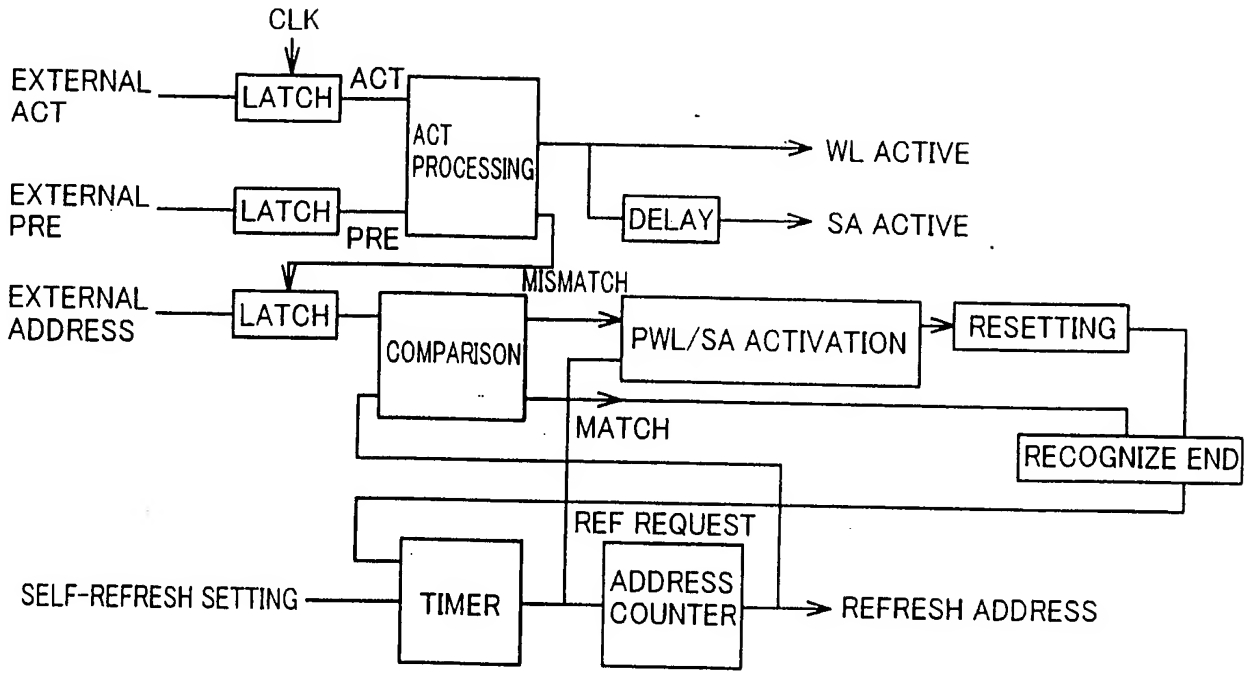

CLK
EXTERNAL ACT
LATCH
ACT
ACT PROCESSING
WL ACTIVE
EXTERNAL PRE
LATCH
PRE
DELAY
SA ACTIVE
MISMATCH
EXTERNAL ADDRESS
LATCH
COMPARISON
PWL/SA ACTIVATION
RESETTING
MATCH
RECOGNIZE END
REF REQUEST
SELF-REFRESH SETTING
TIMER
ADDRESS COUNTER
REFRESH ADDRESS

FIG.21

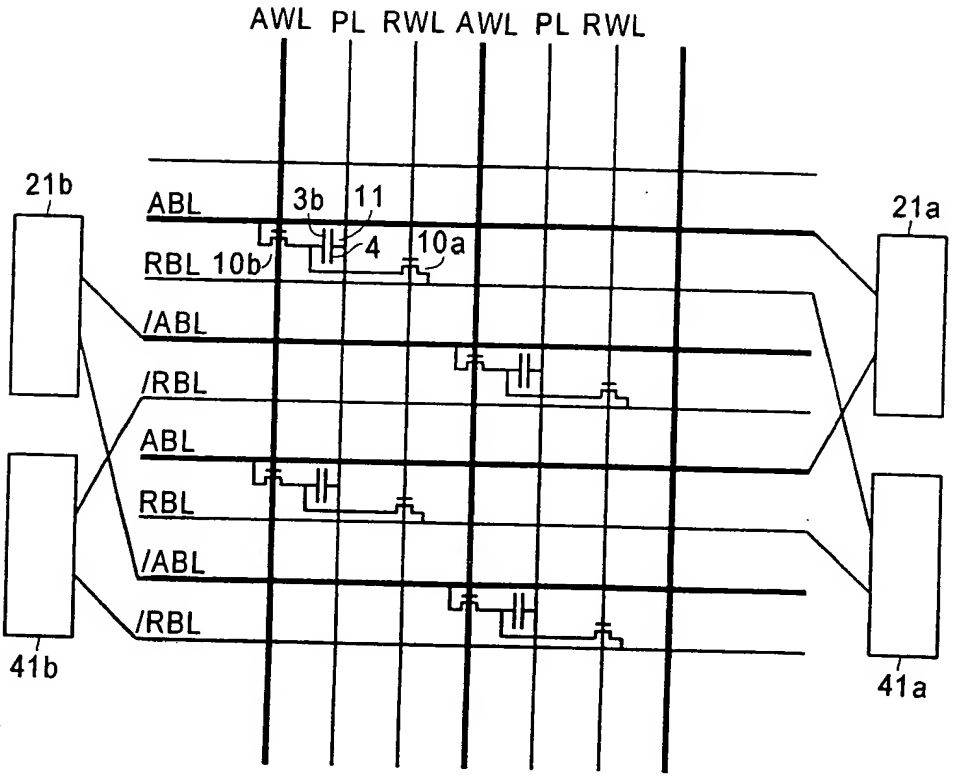

AWL
PL
RWL
AWL
PL
RWL
21b
ABL
3b
11
4
10a
21a
RBL
10b
/ABL
/RBL
ABL
RBL
/ABL
/RBL
41b
41a

FIG.22

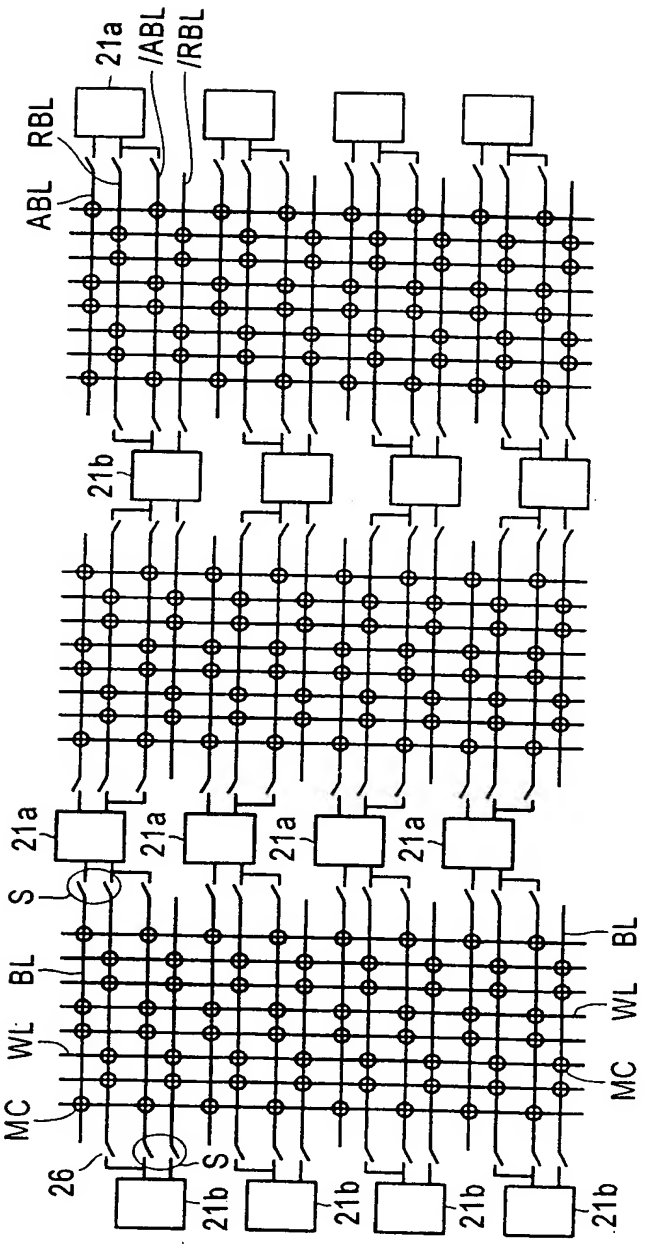

21a
/ABL
/RBL
RBL
ABL
21b
21a
21a
21a
21a
S
BL
WL
MC
26
S
21b
21b
21b
21b
21b
BL
WL
MC

FIG.23

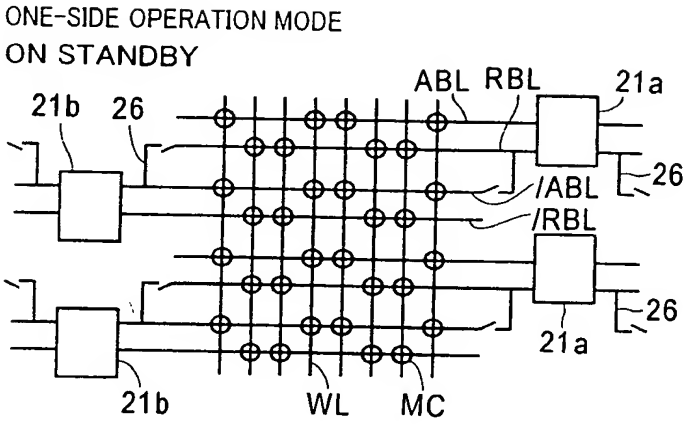

ONE-SIDE OPERATION MODE
ON STANDBY
ABL
RBL
21a
21b
26
/ABL
/RBL
26
26
21a
21b
WL
MC

FIG.24

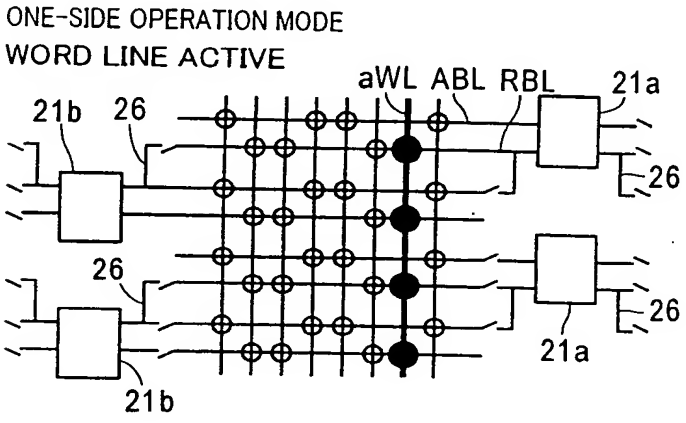

ONE-SIDE OPERATION MODE
WORD LINE ACTIVE
aWL
ABL
RBL
21a
21b
26
26
26
26
21a
21b

FIG.25

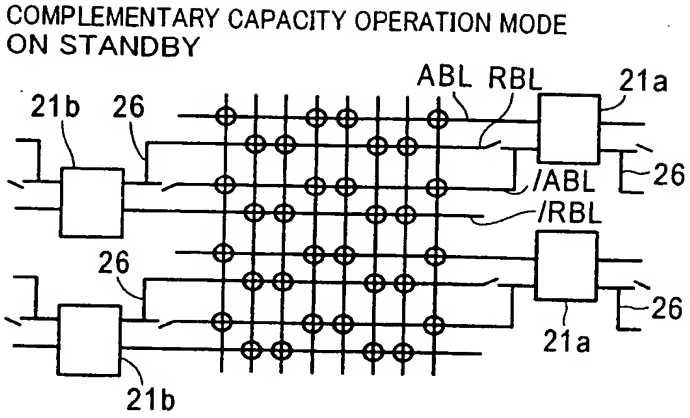

COMPLEMENTARY CAPACITY OPERATION MODE
ON STANDBY
ABL
RBL
21a
21b
26
/ABL
/RBL
26
26
21a
21b

FIG.26

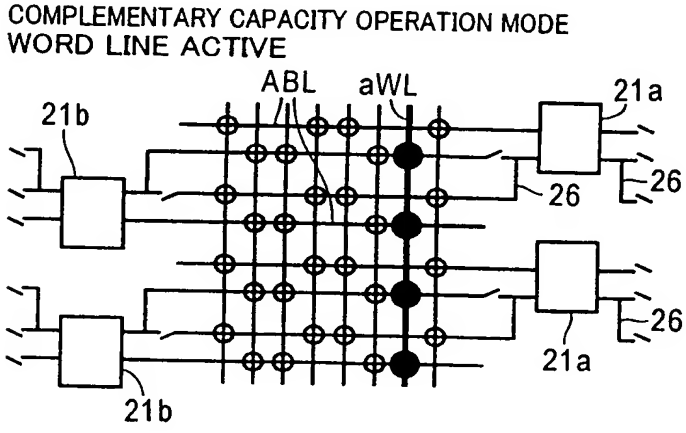
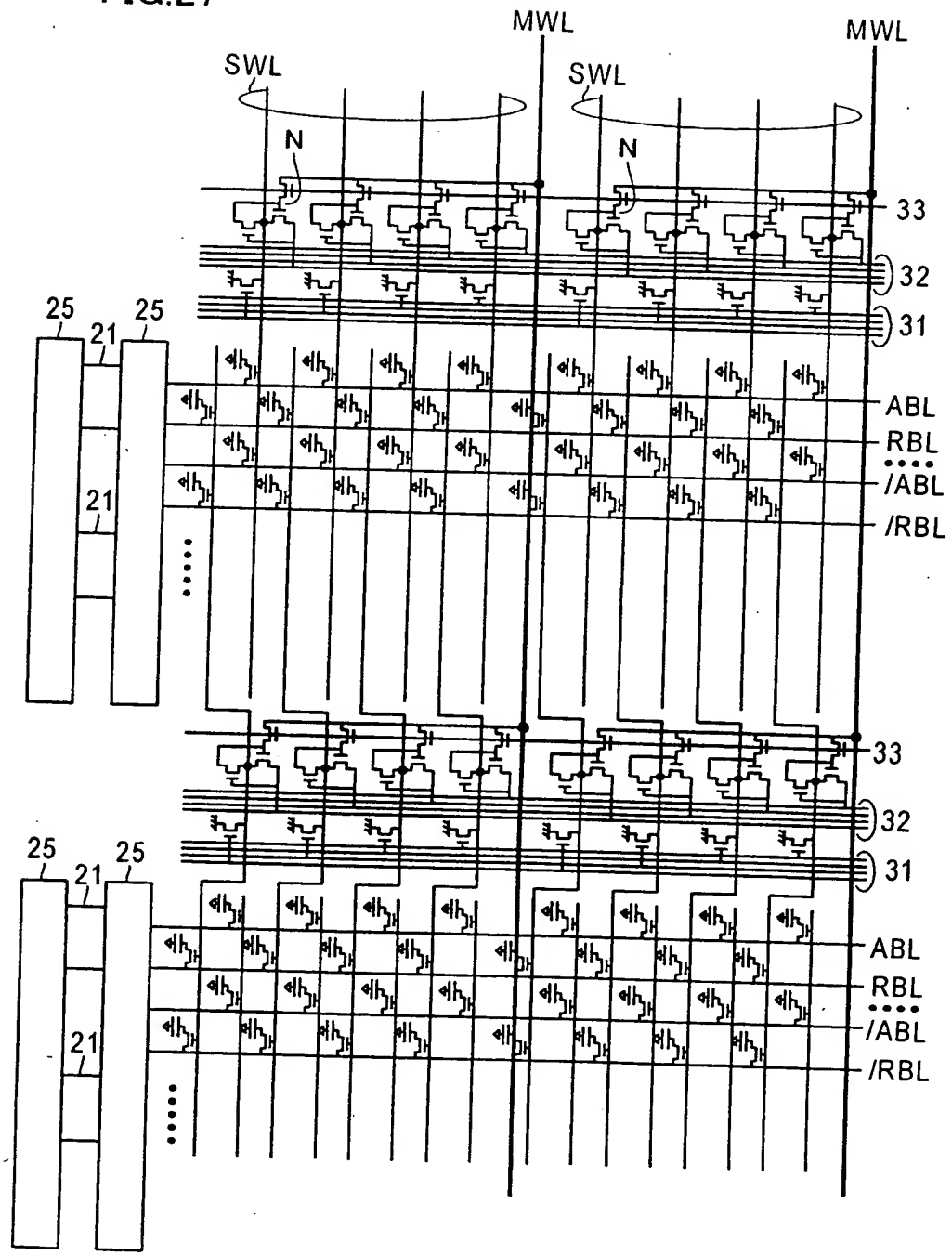

COMPLEMENTARY CAPACITY OPERATION MODE
WORD LINE ACTIVE
ABL
aWL
21a
21b
26
26
26
21a
21b

FIG.27


MWL
MWL
SWL
SWL
N
N
33
32
31
25
21
25
ABL
RBL
/ABL
/RBL
21
33
32
31
25
21
25
ABL
RBL
/ABL
/RBL
21

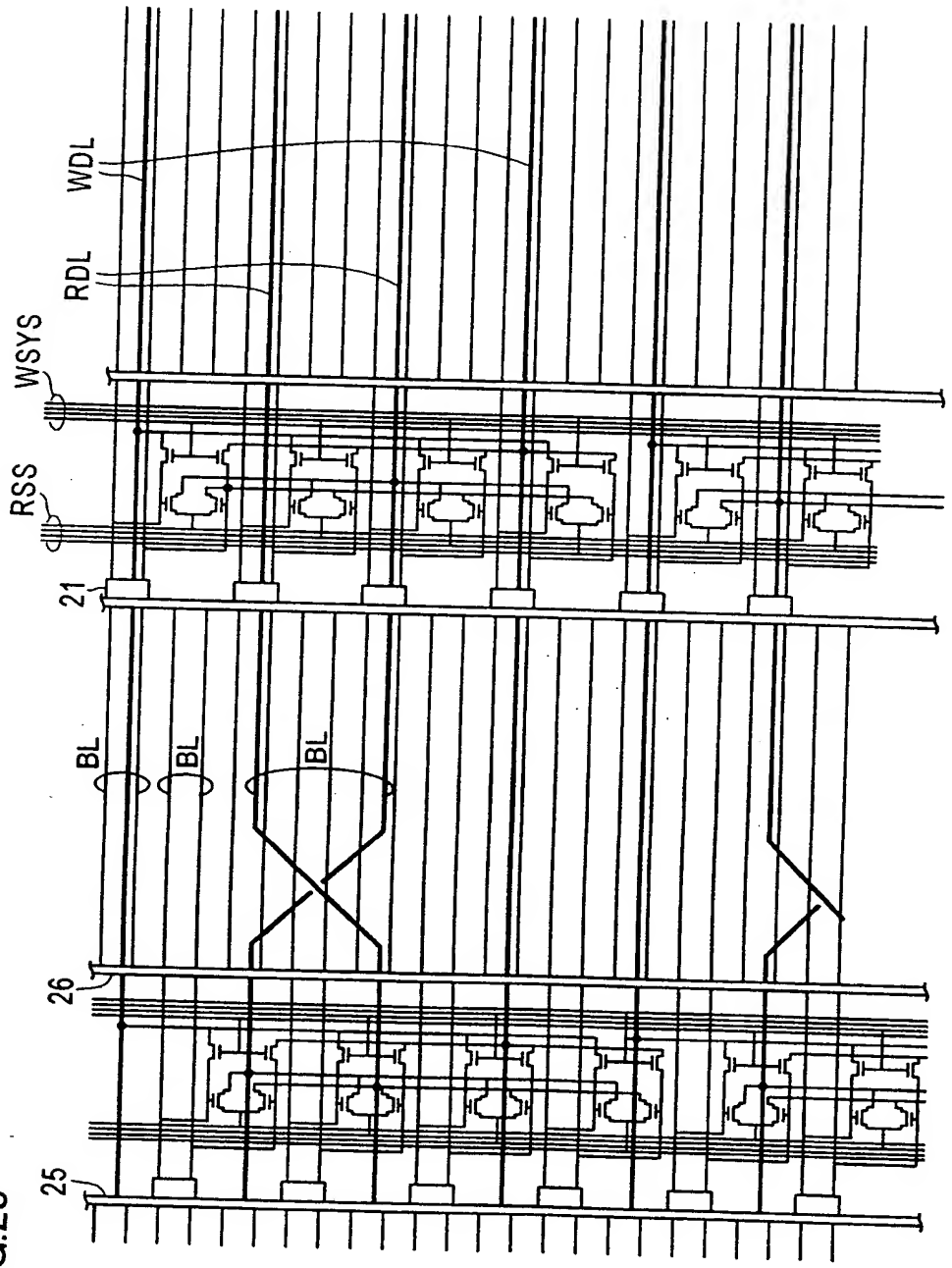


FIG.28

FIG.29

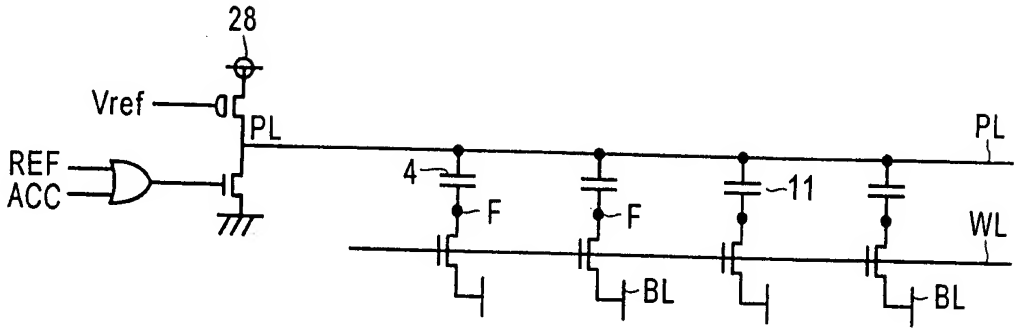


FIG.30

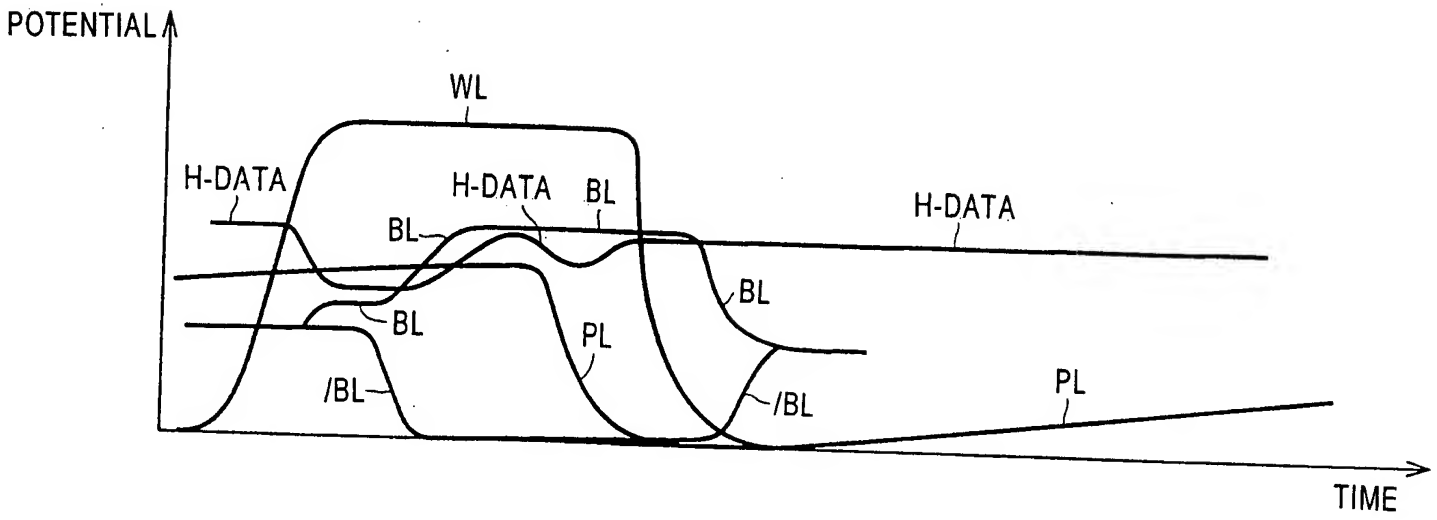


FIG.31

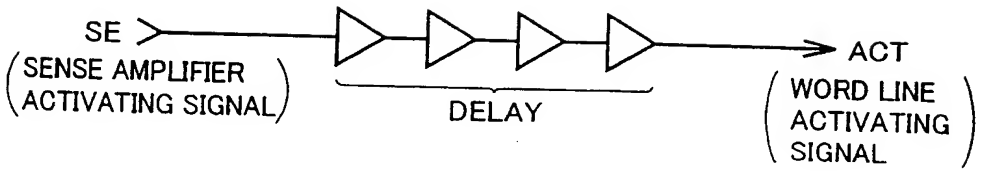

SE
(SENSE AMPLIFIER ACTIVATING SIGNAL)
DELAY
ACT
(WORD LINE ACTIVATING SIGNAL)

FIG.32

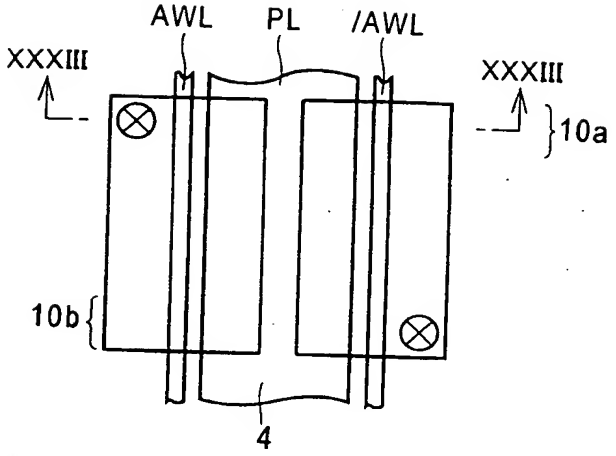
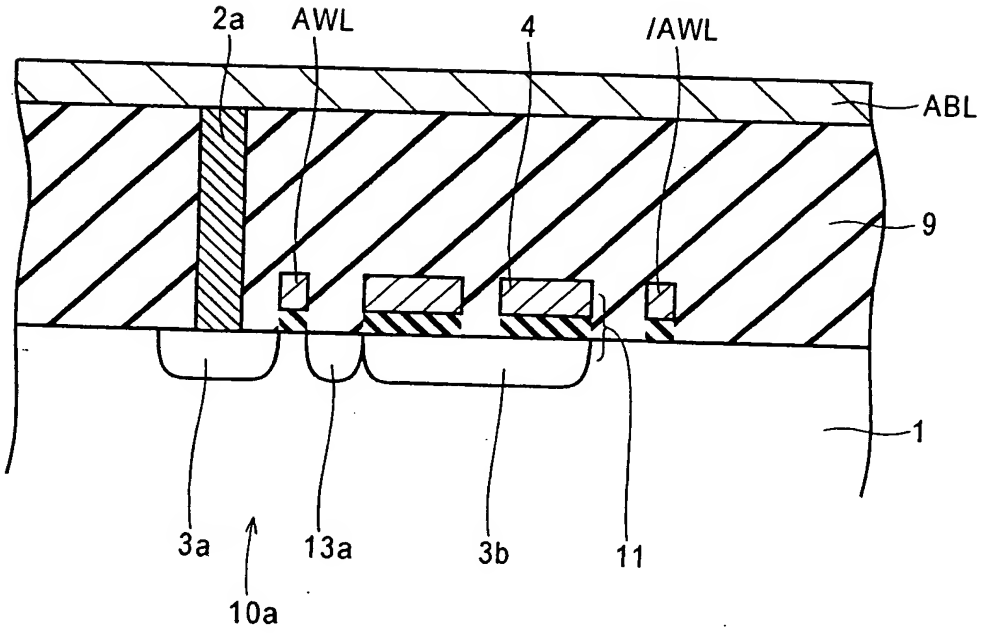

AWL
PL
/AWL
XXXIII
XXXIII
10a
10b
4

FIG.33


2a
AWL
4
/AWL
ABL
9
1
3a
13a
3b
11
10a

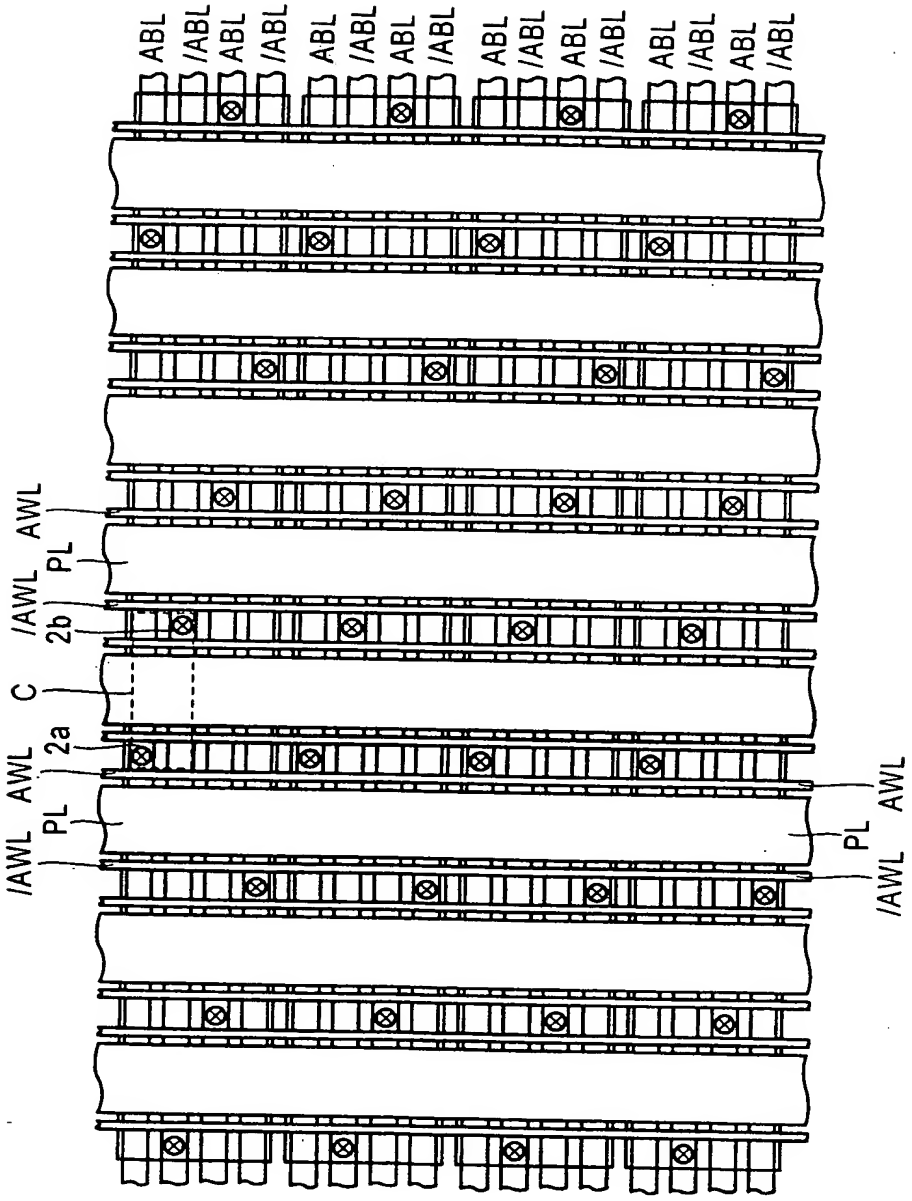



FIG.34